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AUTHOR Strawitz, Barbara M.
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ABSTRACT

The purpose of this study was to investigate the relationship between dogmatism and the beliefs of preservice and inservice elementary teachers about teaching science. In 1974, 61 elementary education majors and 32 inservice elementary teachers taking science methods courses at Louisiana State University responded to 2 instruments after 13 weeks of instruction. Some of their many learning activities included teaching peers and practicing questioning skills. Form E of the Rokeach Dogmatism Scale was used as the dogmatism measure, and a revised questionnaire by Good was used to assess teacher beliefs about teaching science in the elementary school. Significant negative correlations were found between dogmatism and teacher beliefs. The results are consistent with the theoretical principle that high dogmatics are less able than low dogmatics to learn new beliefs. If one assumes that what a teacher does in the classroom is in part related to what he intends to do, then beliefs about teaching science and role perception are important. (LS)

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DOGMATISM AND THE BELIEFS OF PRESERVICE AND INSERVICE ELEMENTARY SCIENCE TEACHERS

A Paper Presented at the Forty-Eighth Annual Meeting
of the National Association for Research
in Science Teaching

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by
Barbara M. Strawitz
Louisiana State University
Baton Rouge, Louisiana

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DOGMATISM AND THE BELIEFS OF PRESERVICE AND INSERVICE ELEMENTARY SCIENCE TEACHERS

A growing body of research evidence indicates that a "systems" approach to teacher education substantially improves its effectiveness. Specific operational skills required by teachers as they teach science curricula have been identified and programs focusing on behavior acquisition and modification have been implemented for pre- and inservice training (J. J. Koran, 1972, 1974). There is evidence which suggests that the acquisition and modification of teacher behaviors fostered by particular modes of training are related to certain characteristics of the trainees (Cronbach, 1967; M. L. Koran, 1971; Koran, Snow & McDonald, 1971). Identifying these characteristics is necessary if effective training systems are to be devised.

The purpose of this study was to investigate the relationship between dogmatism and the beliefs of pre- and inservice elementary teachers about teaching science. If one assumes that what a teacher does in the classroom is in part related to what he intends to do, then beliefs about teaching science and role perceptions are important.

The construct of dogmatism formulated by Rokeach (1960) served as the theoretical base for the investigation. Considerable evidence suggests that a dogmatic personality style can be identified and that dogmatism as a cognitive style affects learning (Ehrlich & Lee, 1969), interpersonal perception, and problem-solving behavior (Kemp, 1960, 1962). The basic proposition that closed-minded persons have greater difficulty than open-minded persons in forming new belief systems has

been generally confirmed, although the ability to form new systems appears to be influenced by a number of variables (Rokeach, 1960, p. 398; Ehrlich and Lee, 1969). After collecting dogmatism data while supervising science student teachers over a two year period, the investigator intuitively concluded that this measure of cognitive style could be an important variable to pursue in studying aptitude X treatment interactions in training science teachers. This study was the first of a series designed to probe the implications of the dogmatism concept for science teacher education.

METHODS

The preservice subjects were fifty-seven female and four male elementary education juniors and seniors enrolled in three sections of the undergraduate science methods course at Louisiana State University during the 1974 Spring Semester. Eleven had not participated in field experiences in the public schools, forty-six had participated for one or two semesters, and four had participated for three or four semesters.

The inservice subjects were thirty-one female elementary teachers and one male elementary teacher enrolled in two graduate science methods courses at Louisiana State University during the 1974 Spring Semester. One had no teaching experience other than student teaching, twelve had from one to six years of experience, thirteen had from seven to twelve years of experience, and six had from thirteen to eighteen years of experience. Most of the teachers were employed by the East Baton Rouge Parish School Board, but several were employed in surrounding parishes.

All subjects spent the majority of class time participating in laboratory investigations and teaching peers selected lessons from ESS,

SCIS, and SAPA materials. Opportunities were provided for practicing questioning skills and for discussing topics and as the nature of science, the nature of children's thinking, and planning and evaluation strategies.

The subjects were asked to respond to two instruments after approximately thirteen weeks of instruction. Form E of the Rokeach Dogmatism Scale was used as the dogmatism measure, and the revised version of an inventory developed by Good was used to assess teacher beliefs about teaching science in the elementary school.

DATA SOURCES

Rokeach deductively constructed the Dogmatism Scale (D-Scale) to test the validity of his proposed theory on the effects of cognitive structure on belief acquisition and change (Rokeach, 1960). The forty items on Form E were selected to tap characteristics associated with the three major theoretical dimensions used to describe all belief systems: a belief-disbelief dimension, a central peripheral dimension, and a time perspective dimension. Possible scores on each item ranged from +3 (I agree very much) to -3 (I disagree very much). The total score on the D-Scale was the sum of scores obtained on all items after a constant of 4 was added to each item score. Test-retest reliabilities on Form E as reported by Rokeach (1960, p. 90) for various groups ranged from .68 to .93. A split-half reliability of .88 was reported by Ehrlich (1961) and Brumbaugh, Hoedt, and Beisel (1966). A review of several studies concerned with the validity and reliability of the D-Scale was made by Vacchiano, Strauss, and Hochman (1969).

Good (1971) developed an instrument to assess the beliefs of prospective elementary teachers enrolled in the elementary science methods course at Florida State University. The revised version contained thirty statements about the nature of science for the elementary school, the nature of children, and the role of the elementary science teacher. Possible scores on each statement ranged from +1 (Strongly agree) to +5 (Strongly disagree). The total score on the Assessment Inventory was the sum of scores obtained on all statements. A test-retest reliability of .74 was obtained by the investigator when the revised Assessment Inventory was administered twice to the same subjects during a three week interval. The subjects were seventy-seven elementary education majors at Louisiana State University not enrolled in the science methods course.

RESULTS

Significant negative correlations were found between dogmatism scores and belief scores for both groups. Pearson product-moment correlations were -.49 ($p < .001$) for preservice teachers (N=61) and -.64 ($p < .001$) for inservice teachers (N=32). Subjects in both groups with lower dogmatism scores (more open-minded) tended to have higher belief scores, and those with higher dogmatism scores (more closed-minded) tended to have lower belief scores. There was no statistically significant difference between the correlation coefficients.

DISCUSSION

The findings in the investigation are consistent with the theoretical principle that belief acquisition is related to dogmatism.

The negative correlations could result from the nature of the statements in the Assessment Inventory. Although there are no "correct" or "incorrect" responses, disagree positions, with greater score weights, on approximately two-thirds of the items indicate beliefs that would give children the opportunity to manipulate things and to do their own learning. Two examples of such items are: "Allowing children to do what they want when working with science equipment in the classroom would result in many discipline problems," "It is important but not critical that children have equipment to work with during science lessons in order to gain an understanding of what science is all about." It appears that more open-minded teachers (lower D-Scale scores) tended to believe that children can learn science better by doing things and seeking answers for themselves (higher belief scores).

The finding of a greater negative correlation between D-Scale scores and belief scores for inservice teachers is interesting because the sample size was approximately one-half that of the preservice group. The mean D-Scale score for inservice teachers was found to be significantly lower than that for preservice teachers ($p < .001$). The data are presented in Table 1.

Table 1

t-Test for Dogmatism Scores of Preservice and Inservice Teachers

Group	N	Mean	S.D.	t
Preservice	61	152.74	22.42	3.55*
Inservice	32	135.50	21.84	

*$p < .001$

Although there was no statistically significant difference between correlation coefficients, it appears that the lower D-Scale scores in the inservice group were more strongly related to belief scores. This result raises a number of questions which will be explored in other studies.

After dogmatism scores were shown to be significantly related to belief scores, hypotheses for experimental studies were proposed. Although the studies are beyond the scope of this investigation, one in particular should be of interest. The investigator hypothesized that pre- and inservice subjects with dogmatism scores below the group median score (higher D-Scale scores, more closed-minded) would have significantly lower belief scores than subjects with dogmatism scores above the group median score (lower D-Scale scores, more open-minded). When a t-test was used to compare the means of belief scores within each group, the results supported the hypothesis at the .01 level of significance. The data are presented in Table 2. This finding suggests that dogmatism may affect the belief acquisition of teachers in a science methods course.

Table 2

t-Tests for Belief Scores of Preservice and Inservice Teachers

Group	N	Mean	S.D.	t
Preservice D-Scores Below Median 154 (High D's)	30	84.43	6.58	3.04*
Preservice D-Scores Above Median (Low D's)	30	90.40	8.52	
Inservice D-Scores Below Median 133 (High D's)	16	92.19	8.04	2.87*
Inservice D-Scores Above Median (Low D's)	16	101.38	9.91	

*$p < .01$

CONCLUSIONS

The major purpose of this investigation was to examine the relationship between dogmatism and the beliefs of preservice and inservice teachers about teaching science to elementary school children. Within the restrictions of this study, the findings support the following conclusions:

1. The beliefs of preservice and inservice elementary teachers about teaching science at the end of science methods courses are significantly related to their dogmatic personality styles ($p < .001$).

2. The Rokeach Dogmatism Scale, Form E, can be used to predict, to some extent, beliefs about teaching elementary school science.

3. The dogmatism measure of cognitive style appears to be an important variable to consider in studying aptitude X treatment interactions in training science teachers.

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